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FAR-END CALIBRATING AND TRANSFER DEVICE AND METHOD

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FAR-END CALIBRATING AND TRANSFER DEVICE AND METHOD

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The present invention pertains to a type of far-end calibrating and transfer device and method. In particular, the present invention pertains to a type of far-end calibrating and transfer device for an instrument and a far-end calibrating and transfer method that can be used to calibrate a measurement instrument. /5*

It is necessary to calibrate a measurement instrument to maintain its accuracy. To calibrate a measurement instrument, a special calibrator is usually used to provide an accurate electric calibration characteristic. Then, the instrument to be calibrated is used to measure this electric calibration characteristic to obtain the measurement error of this instrument so that the instrument can be adjusted appropriately. For example, when calibrating an electric meter, a calibrator is usually used to provide a prescribed voltage to perform calibration. Some calibrators, such as the Fluke 5700A multifunctional calibrator, can provide plural types of electric characteristics, such as voltage, resistance, capacitance, etc.

A calibrator is usually fairly expensive to an organization that needs to calibrate an instrument. Therefore, it is usually necessary to rent a calibrator from another organization (such as a national research institute) or to send a batch of measurement instruments to a place for calibration, which requires a large amount of manpower and material resources. In addition, the

* [The numbers in the right margin indicate pagination of the original foreign text.]

fact that the calibrated measurement instruments may be affected by some factors during the transportation must be taken into consideration. It is necessary to improve the conventional instrument calibrating method.

We now have an advanced communication system. If we can take advantage of the communication system to calibrate instruments, we can solve the aforementioned problems of the conventional instrument calibrating method.

In order to realize this purpose, the present invention provides the following:

Summary of the invention

The first characteristic of the present invention is a type of calibrating device, which can use a calibration signal in a first zone to calibrate a measurement instrument in a second zone. /6
This calibrating device includes a signal-generating unit that can generate the aforementioned calibration signal, a first converting unit that can convert the calibration signal based on a reference signal in a first range to generate a corresponding first digital signal, a feedback control unit that corrects the first digital signal based on at least one correcting value to generate a second digital signal, a second converting unit that converts the second digital signal based on a reference signal in a second range to generate a corresponding simulated calibration signal, a third converting unit that converts the simulated calibration signal based on a reference signal in a third range to generate a corresponding third digital signal. The feedback control unit continuously adjusts the second digital signal until the difference between the first and third digital signals is smaller than a prescribed value. The simulated calibration signal obtained at that time is a stable simulated calibration signal close to the calibration signal. The stable simulated calibration signal is used to calibrate the measurement instrument.

The signal-generating unit, the first converting unit, and the feedback control unit are arranged in the first zone. The second and third converting units are arranged in the second zone.

This calibrating device also includes a communication device, which transfers the first, second, and third digital signals between the first and second zones. The communication device is an Internet network system.

The correcting value includes the ratio between the first, second, and third ranges or the difference between the first, second, and third reference signal ranges.

The feedback control unit is installed in a computer.

The second characteristic of the present invention is a type of transfer device used to transfer an analog signal from the first zone to the second zone. This transfer device includes a first converting unit that converts the analog signal based on a reference signal in a first range to /7
generate a corresponding first digital signal, a feedback control unit that corrects the first digital signal based on at least one correcting value to generate a second digital signal sent to the second

zone; a second converting unit that converts the second digital signal based on a reference signal in a second range to generate a corresponding simulated analog signal; a third converting unit that converts the simulated analog signal based on a reference signal in a third range to generate a corresponding third digital signal. The feedback control unit continuously adjusts the second digital signal until the difference between the first and third digital signals is smaller than a prescribed value. The simulated analog signal obtained at that time becomes a stable simulated analog signal close to the original analog signal.

The first converting unit and the feedback control unit are arranged in the first zone. The second and third converting units are arranged in the second zone. This calibrating device also includes a communication device, which transfers the first, second, and third digital signals between the first and second zones. The communication device is an Internet network system.

The correcting value includes the ratio between the first, second, and third ranges or the difference between the first, second, and third reference signal ranges.

The feedback control unit is installed in a computer.

The third characteristic of the present invention is a method for establishing far-end calibration. This method uses a calibration signal to calibrate a far-end measurement instrument. This method includes the following steps: convert the calibration signal to generate a first digital signal; provide at least one correcting value to correct the first digital signal to generate the second digital signal; transfer the second digital signal to the far end; convert the second digital signal at the far end into a simulated calibration signal; convert the simulated calibration signal into a third digital signal; feed back the third digital signal to adjust the second digital signal until the difference between the third and first digital signals is smaller than a prescribed value so that /8 the simulated calibration approaches a stable simulated analog calibration signal, which is used to calibrate the measurement instrument; provide a signal detector to detect the calibration signal and the stable simulated calibration signal and adjust the correcting value based on the detection difference between the stable simulated calibration signal and the calibration signal; repeat the aforementioned steps until the detection difference is smaller than another prescribed value.

The fourth characteristic of the present invention is a method for establishing far-end calibration. This method uses a calibration signal to calibrate a far-end measurement instrument. This method includes the following steps: transfer the calibration signal to the far end via a digital conversion process and convert it back to a simulated calibration signal through an analog conversion; feed back the simulated calibration signal to adjust the digital conversion process until the simulated calibration signal becomes a stable simulated calibration signal close to the calibration signal; the stable simulated calibration signal is used to calibrate the measurement instrument.

The fifth characteristic of the present invention is a method for establishing far-end transfer. This method is used to transfer an analog signal to the far end. This method includes the following steps: convert the analog signal to generate a first digital signal; provide at least one correcting value to correct the first digital signal to generate a second digital signal; transfer the second digital signal to the far end; convert the second digital signal at the far end into a simulated analog signal; convert the simulated analog signal into a third digital signal; feed back the third digital signal to adjust the second digital signal until the difference between the third and first digital signals is smaller than a prescribed value so that the simulated analog signal approaches a stable simulated analog signal; provide a signal detector to detect the analog signal and the stable simulated analog signal and adjust the correcting value based on the detection /9
difference between the stable simulated analog signal and the analog signal; repeat the aforementioned steps until the detection difference is smaller than another prescribed value.

The sixth characteristic of the present invention is a method for establishing far-end transfer. This method is used to transfer an analog signal to the far end. This method includes the following steps: transfer the analog signal to the far end via a digital conversion process and convert it back to a simulated analog signal through an analog conversion; feed back the simulated analog signal to adjust the digital conversion process until the simulated analog signal becomes a stable simulated analog signal close to the original analog signal.

The seventh characteristic of the present invention is a method for calibrating the calibrating device described in Claim 1. This method has the following steps: use a signal detector to detect the calibration signal and the stable simulated calibration signal and adjust the correcting value based on the detection difference between the stable simulated calibration signal and the calibration signal; repeat the aforementioned steps until the detection difference is smaller than a prescribed value.

The eighth characteristic of the present invention is a method for calibrating the transfer device described in Claim 8. This method has the following steps: use a signal detector to detect the analog signal and the stable simulated analog signal and adjust the correcting value based on the detection difference between the stable simulated analog signal and the analog signal; repeat the aforementioned steps until the detection difference is smaller than a prescribed value.

Brief description of the figures

In order to make the aforementioned purposes, characteristics, and advantages of the present invention easier to understand, an application example will be explained in detail below, /10
based on the attached figures.

Figure 1 is a diagram illustrating the configuration of the transfer device disclosed in the application example of the present invention.

Figure 2 is a diagram illustrating the configuration of the calibrating device disclosed in the application example of the present invention.

Figure 3 shows the method for establishing far-end transfer disclosed in the present invention.

Figure 4 shows the details of the method for establishing far-end transfer disclosed in the present invention.

Figure 5 shows the calibrating method for the transfer device of the present invention.

Explanation of symbols

100	Transfer device
200	Calibrating device
10	First converting unit
20	Feedback control unit
30	Second converting unit
40	Third converting unit
50	Communication device
60	Calibrator
70	Measurement instrument
AS	Analog signal
CS	Calibration signal
DS1	First digital signal
DS2	Second Digital signal
DS3	Third digital signal
CE	Correcting value
SAS	Simulated analog signal
SCS	Simulated calibration signal
SSAS	Stable simulated analog signal
SSCS	Stable simulated calibration signal

<u>Detailed explanation of the invention</u>

Figure 1 shows the configuration of transfer device 100 of the present invention.

In the aforementioned calibrator, in order to maintain the accuracy of the provided calibrating voltage, the length of the connecting wire at the output terminal must be usually smaller than 1 m. The present invention provides a transfer device 100 used to transfer an analog signal AS over long distance with the distortion of the analog AS smaller than a prescribed /11

value. By using this transfer device 100, it is possible to accurately transfer the output calibrating voltage of the calibrator to the instrument to be calibrated to perform "far-end calibration." This transfer device 100 includes a first converting unit 10, a feedback control unit 20, a second converting unit 30, and a third converting unit 40.

The first converting unit 10 and feedback control unit 20 are located in the first zone that provides the calibrating voltage. When the electronic devices perform conversion between analog and digital signals (A/D, D/A conversion), the output is determined based on a reference signal provided from outside (usually a fixed reference voltage). The first converting unit 10 converts the analog signal AS based on a reference signal in a first range to generate a corresponding first digital signal DS1. Feedback control unit 20 corrects the first digital signal DS1 based on at least one correcting value CE to generate a second digital signal DS2 which is sent to the second zone. There may be a fairly long distance from the first zone to the second zone, for example, from USA to Japan. These zones, however, can also be different rooms in the same building.

The second, third converting units 30, 40 are located in the second zone. The second converting unit 30 converts the second digital signal DS2 based on a reference signal in a second range to generate a corresponding simulated analog signal SAS. The third converting unit 40 converts the simulated analog signal SAS based on a reference signal in a third range to generate a corresponding third digital signal DS3. The third digital signal DS3 is used as the feedback signal, which is sent back to feedback control unit 20.

In the following, the correcting value CE used by feedback control unit 20 will be explained. The correcting value CE is set appropriately to offset the errors between the reference signals (voltages) of the first, second, and third ranges. Ideally, the same reference signal /12
(voltage) is used to perform conversion between analog and digital signals so that there is no need to worry about the aforementioned error problem. In fact, however, the voltage source of the second zone is different from the reference voltage of the first zone. For example, when comparing two groups of voltages of 5 V measured in the two zones, the 5 V in the second zone may be just the 5.001 V in the first zone. Consequently, when the analog signal AS is output from the first zone after the digital conversion (that is, the first digital signal DS1), it is necessary to make an adjustment using the aforementioned correcting value in order to offset the difference caused by the different conditions at the two ends. It is preferable for the correcting value to include the range ratio between the first, second, and third ranges to offset the signal increase or decrease occurring during the conversion process and to include the actual differences between the zero potentials of the first, second, and third ranges to correct the signal deviation occurring during the conversion process.

In addition, in order to overcome the errors caused by other factors (such as temperature, humidity, vibration, étc.), said feedback control unit 20 continuously feeds back the third digital signal DS3 and adjusts the second digital signal DS2 until the difference between the first and third digital signals DS1, DS3 is smaller than a prescribed value, so that the simulated analog signal SAS becomes a stable simulated analog signal SSAS close to the original analog signal.

There is also a communication device 50 used to transfer the first, second, third digital signals between the first and second zones. It is preferable that said communication device 50 be the current Internet network system or local network. In addition, the feedback control unit is preferably installed in a computer, that is, installed in the form of software.

Since accurate far-end transfer can only be achieved using digital signals, but digital signals can only reflect the subjective voltage value at one end and are unable to truly reflect the relative voltage value with respect to the other end, it is not possible to obtain the values of the aforementioned first, second, and third ranges with respect to the first zone via remote communication (including telephone consultation). Therefore, the present invention can only /13
obtain the aforementioned correcting value CE manually. The same signal detector is used to conduct plural detection groups with respect to the input and output signals (that is, the analog signal AS and the simulated analog signal SAS) at the two ends to estimate the aforementioned required correcting value CE. The adjusted correcting value CE can be specially used to transfer the analog signal AS in the second zone (as long as the unit devices in the first and second zones are not changed).

As shown in Figure 2, when providing the calibration service, a calibration signal CS (usually, a calibrating voltage) provided by a signal-generating unit, that is, calibrator 60 is sent as said analog signal AS to the second zone. At that time, the calibrating device 200 disclosed in the present invention can be used. The generated stable simulated analog signal SSAS is called stable simulated calibration signal SSCS in calibrating device 200. This signal is used to calibrate a measurement instrument 70. The other units are not changed and will not be explained again.

If there are many customers who need the calibration service, it is necessary to send somebody to each customer to detect a specific group of correcting values for that customer that will be used for the calibration service later. Of course, in order to maintain the accuracy, it is necessary to conduct detection periodically to correct each correcting value.

The aforementioned device of the present invention is based on the method disclosed in the present invention. In the following, the method for establishing far-end transfer disclosed in the present invention will be explained based on the block diagram shown in Figure 3. As described above, the far-end transfer is used to transfer an analog signal AS to a far end. This method includes the following steps: (S1) transfer this analog signal AS to the far end via a

digital conversion process and convert it back into a simulated analog signal SAS via an analog conversion; and (S2) feed back the simulated analog signal SAS to adjust the digital conversion process until the simulated analog signal SAS becomes a stable simulated analog signal SSAS /14 close to the original analog signal.

Figure 4 shows the method for establishing far-end transfer of the present invention in greater detail. It includes the following steps: (S1) convert the analog signal to generate a first digital signal DS1; (S2) provide at least one correcting value CE to correct the first digital signal DS1 to generate a second digital signal DS2; (S3) transfer the second digital signal DS2 to the far end; (S4) convert the second digital signal DS2 at the far end into a simulated analog signal SAS; (S5) convert the simulated analog signal SAS into a third digital signal DS3; (S6) feed back the third digital signal DS3 to adjust the second digital signal DS2 until the difference between the third and first digital signals DS3, DS1 is smaller than a prescribed value so that the simulated analog signal SAS approaches a stable simulated analog signal SSAS; (S7) provide a signal detector to detect the analog signal AS and the stable simulated analog signal SSAS and adjust the correcting value based on the detection difference between the stable simulated analog signal SSAS and the analog signal AS; (S8) repeat the aforementioned steps until the detection difference is smaller than another prescribed value.

The present invention also discloses a far-end calibrating method based on the aforementioned far-end transfer method. In this case, the aforementioned calibration signal CS is used as the aforementioned analog signal AS, and the aforementioned stable simulated analog signal SSAS is used to provide the calibrating voltage for a measurement instrument to be calibrated at the far end. The rest of this far-end calibrating method is the same as the far-end transfer method and will not be explained again.

Also, as described above, the correcting value for transfer device 100 is adjusted based on the calibrating method disclosed in the present invention and is used to calibrate transfer device 100. It includes the steps shown in Figure 5: (S1) provide a signal detector to detect the analog signal AS and the stable simulated analog signal SSAS and adjust the correcting value based on /15 the detection difference between the stable simulated analog signal SSAS and the analog signal AS; and (S2) repeat the aforementioned step until the detection difference is smaller than a prescribed value.

The calibrating device 200 using said transfer device 100 can also be calibrated using the aforementioned method. In this case, the calibration signal CS is used as the analog signal AS, and the stable simulated calibration signal SSCS is used as the stable simulated analog signal SSAS. The rest part is the same and will not be explained again.

When using the device and method of the present invention to conduct far-end measurement, it is possible to conduct calibration via a communication system, such as an

Internet network, by only establishing the data of the correcting values at the far end in advance. There is no need to transport the measurement instrument every time that a calibration is required. In this way, it is possible to effectively save manpower, material sources, and time, etc. The present invention is particularly important to the organizations that need to frequently calibrate their measurement instruments.

Although the present invention has been explained in detail based on the aforementioned application example, it is not limited to this application example. Anybody who is familiar with this technology can make changes or modifications without deviating from the main point of the present invention. Consequently, the protection range of the present invention should be determined based on the attached claims.

Claims /16

1. A type of calibrating device characterized by the following facts: the calibrating device uses a calibration signal in a first zone to calibrate a measurement instrument in a second zone; this calibrating device includes:

a signal-generating unit that can generate the aforementioned calibration signal;

a first converting unit that can convert the calibration signal based on a reference signal in a first range to generate a corresponding first digital signal;

a feedback control unit that corrects the first digital signal based on at least one correcting value to generate a second digital signal;

a second converting unit that converts the second digital signal based on a reference signal in a second range to generate a corresponding simulated calibration signal;

a third converting unit that converts the simulated calibration signal based on a reference signal in a third range to generate a corresponding third digital signal;

the feedback control unit continuously adjusts the second digital signal until the difference between the first and third digital signals is smaller than a prescribed value; the simulated calibration signal obtained at that time is a stable simulated calibration signal close to the calibration signal; the stable simulated calibration signal is used to calibrate the measurement instrument.

2. The calibrating device described in Claim 1 characterized by the fact that the signal-generating unit, the first converting unit, and the feedback control unit are arranged in the first zone, while the second and third converting units are arranged in the second zone.

3. The calibrating device described in Claim 2 characterized by also including a communication device, which transfers the first, second, and third digital signals between the first and second zones.

4. The calibrating device described in Claim 3 characterized by the fact that the communication device is an Internet network system.

5. The calibrating device described in Claim 1 characterized by the fact that the correcting value includes the ratio between the first, second, and third ranges. /17

6. The calibrating device described in Claim 1 characterized by the fact that the correcting value includes the difference between the first, second, and third reference signal ranges.

7. The calibrating device described in Claim 1 characterized by the fact that the feedback control unit is installed in a computer.

8. A type of transfer device characterized by the following facts: the transfer device is used to transfer an analog signal from a first zone to a second zone; this transfer device includes:

a first converting unit that converts the analog signal based on a reference signal in a first range to generate a corresponding first digital signal;

a feedback control unit that corrects the first digital signal based on at least one correcting value to generate a second digital signal sent to the second zone;

a second converting unit that converts the second digital signal based on a reference signal in a second range to generate a corresponding simulated analog signal;

a third converting unit that converts the simulated analog signal based on a reference signal in a third range to generate a corresponding third digital signal;

the feedback control unit continuously adjusts the second digital signal until the difference between the first and third digital signals is smaller than a prescribed value; the simulated analog signal obtained at that time becomes a stable simulated analog signal close to the original analog signal.

9. The transfer device described in Claim 8 characterized by the fact that the first converting unit and the feedback control unit are arranged in the first zone, while the second and third converting units are arranged in the second zone.

10. The transfer device described in Claim 9 characterized by also including a communication device, which transfers the first, second, and third digital signals between the /18
first and second zones.

11. The transfer device described in Claim 8 characterized by the fact that the communication device is an Internet network system.

12. The transfer device described in Claim 8 characterized by the fact that the correcting value includes the ratio between the first, second, and third ranges.

13. The transfer device described in Claim 8 characterized by the fact that the correcting value includes the difference between the first, second, and third reference signal ranges.

14. The transfer device described in Claim 8 characterized by the fact that the feedback control unit is installed on a computer.

15. A method for establishing far-end calibration characterized by the following facts: this method uses a calibration signal to calibrate a far-end measurement instrument; this method includes the following steps:

convert the calibration signal to generate a first digital signal;

provide at least one correcting value to correct the first digital signal to generate the second digital signal; transfer the second digital signal to the far end;

convert the second digital signal at the far end into a simulated calibration signal; convert the simulated calibration signal into a third digital signal;

feed back the third digital signal to adjust the second digital signal until the difference between the third and first digital signals is smaller than a prescribed value, so that the simulated calibration approaches a stable simulated analog calibration signal, which is used to calibrate the measurement instrument;

provide a signal detector to detect the calibration signal and the stable simulated calibration signal and adjust the correcting value based on the detection difference between the /19
stable simulated calibration signal and the calibration signal; and

repeat the aforementioned steps until the detection difference is smaller than another prescribed value.

16. A method for establishing far-end calibration characterized by the following facts: the far-end calibration uses a calibration signal to calibrate a far-end measurement instrument; this method includes the following steps:

transfer the calibration signal to the far end via a digital conversion process and convert it back into a simulated calibration signal via an analog conversion; and

feed back the simulated calibration signal to adjust the digital conversion process until the simulated calibration signal becomes a stable simulated calibration signal close to the calibration signal; the stable simulated calibration signal is used to calibrate the measurement instrument.

17. A method for establishing far-end transfer characterized by the following facts: this method is used to transfer an analog signal to the far end; this method includes the following steps:

convert the analog signal to generate a first digital signal; provide at least one correcting value to correct the first digital signal to generate a second digital signal; transfer the second digital signal to the far end;

convert the second digital signal at the far end into a simulated analog signal; convert the simulated analog signal into a third digital signal;

feed back the third digital signal to adjust the second digital signal until the difference between the third and first digital signals is smaller than a prescribed value so that the simulated analog signal approaches a stable simulated analog signal;

provide a signal detector to detect the analog signal and the stable simulated analog signal and adjust the correcting value based on the detection difference between the stable simulated analog signal and the analog signal; and

repeat the aforementioned steps until the detection difference is smaller than another prescribed value.

18. A method for establishing far-end transfer characterized by the following facts: this method is used to transfer an analog signal to a far end; this method includes the following steps:

transfer the analog signal to the far end via a digital conversion process and convert it back to a simulated analog signal through an analog conversion; and

feed back the simulated analog signal to adjust the digital conversion process until the simulated analog signal becomes a stable simulated analog signal close to the original analog signal.

19. A method for calibrating the calibrating device described in Claim 1 having the following steps: use a signal detector to detect the calibration signal and the stable simulated calibration signal and adjust the correcting value based on the detection difference between the stable simulated calibration signal and the calibration signal; and

repeat the aforementioned steps until the detection difference is smaller than a prescribed value.

20. A method for calibrating the transfer device described in Claim 8 having the following steps: use a signal detector to detect the analog signal and the stable simulated analog signal and adjust the correcting value based on the detection difference between the stable simulated analog signal and the analog signal; and

repeat the aforementioned steps until the detection difference is smaller than a prescribed value.

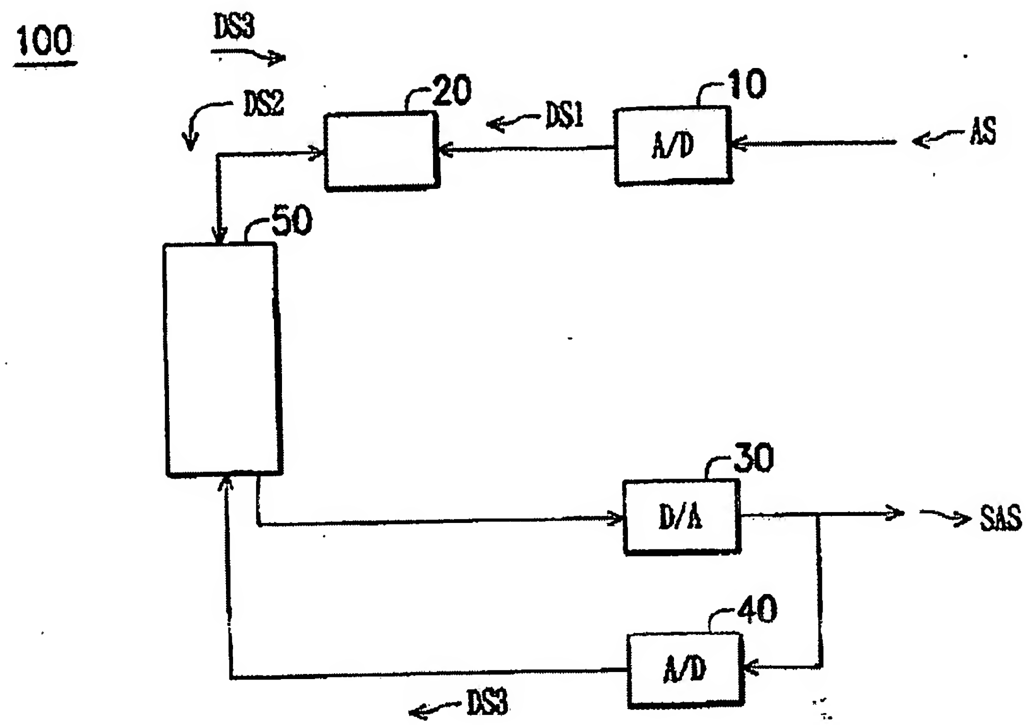

Figure 1

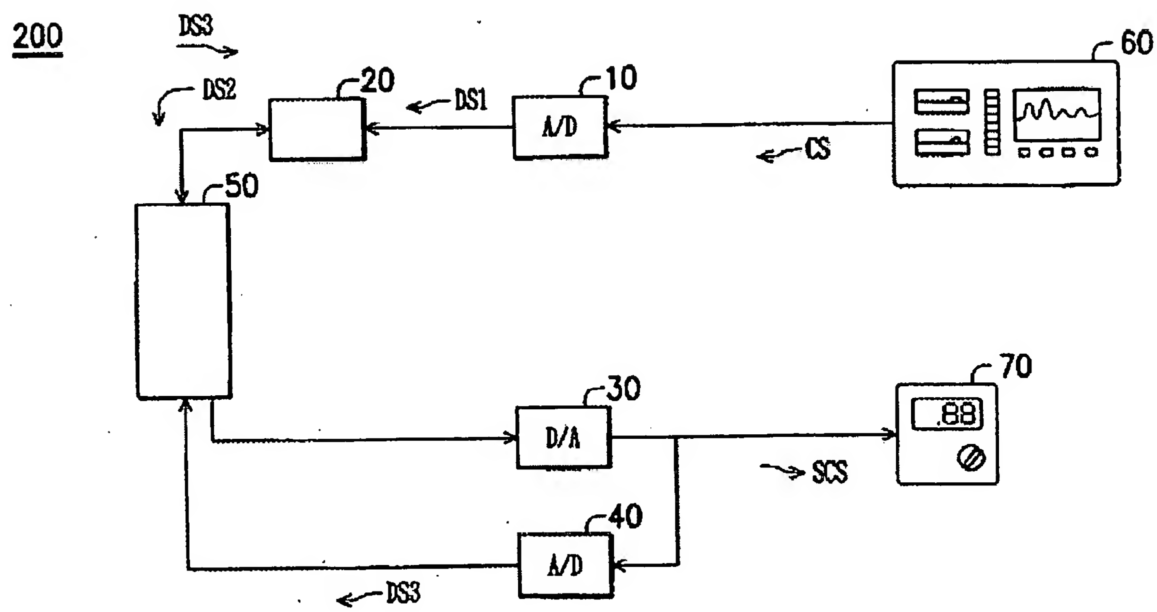

Figure 2

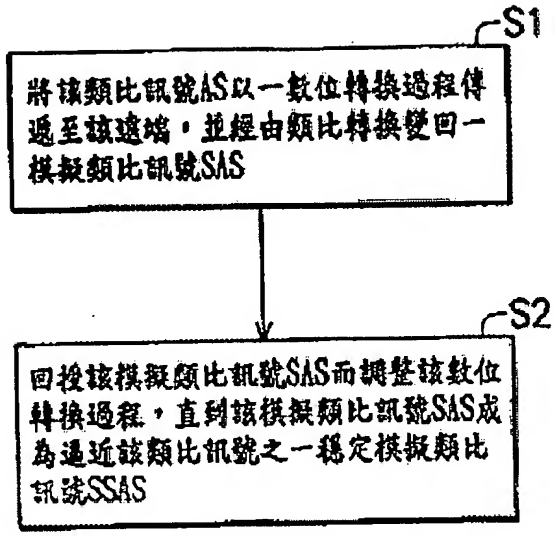

Figure 3

Key: S1 Transfer analog signal AS to a far end via a digital conversion process and convert it back into a simulated analog signal SAS via an analog conversion

S2 Feed back the simulated analog signal SAS to adjust the digital conversion process until the simulated analog signal SAS becomes a stable simulated analog signal SSAS close to the analog signal

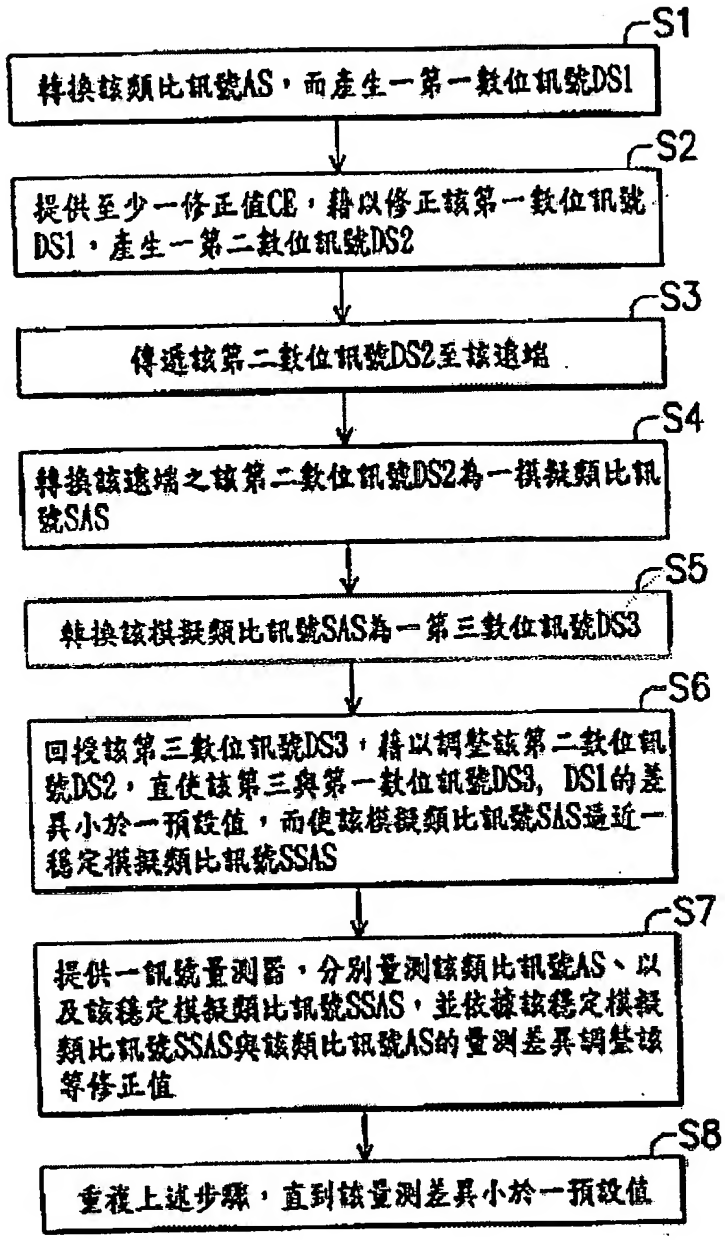

Figure 4

Key:

Key:	S1	Convert analog signal AS to generate the first digital signal DS1
	S2	Provide at least one correcting value CE to correct the first digital signal DS1 to generate a second digital signal DS2
	S3	Transfer the second digital signal DS2 to the far end
	S4	Convert the second digital signal DS2 at the far end into a simulated analog signal SAS
	S5	Convert the simulated analog signal SAS into a third digital signal DS3

S6 Feed back the third digital signal DS3 to adjust the second digital signal DS2 until the difference between the third and first digital signals DS3, DS1 is smaller than a prescribed value so that the simulated analog signal SAS approaches a stable simulated analog signal SSAS

S7 Provide a signal detector to detect the analog signal AS and the stable simulated analog signal SSAS and adjust the correcting value based on the detection difference between the stable simulated analog signal SSAS and the analog signal AS

S8 Repeat the aforementioned steps until the detection difference is smaller than another prescribed value

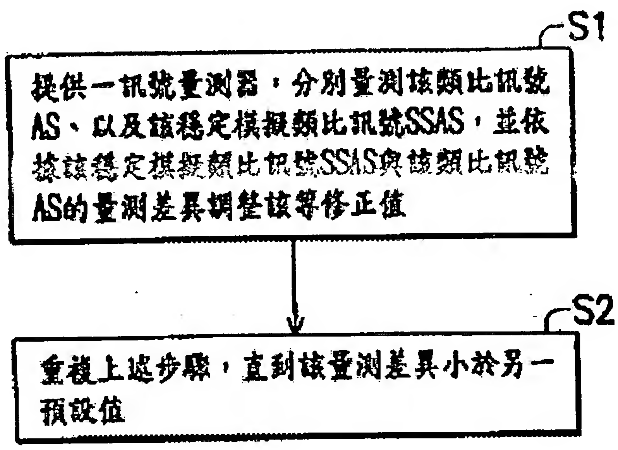

Figure 5

Key: S1 Provide a signal detector to detect the analog signal AS and stable simulated analog signal SSAS and adjust the correcting value based on the detection difference between the stable simulated analog signal SSAS and the analog signal AS

S2 Repeat the aforementioned step until the detection difference is smaller than another prescribed value

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本案已向

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	無		

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	無	

四、中文發明摘要 （發明之名稱：遠端校正與傳遞之裝置及其方法）

一種遠端校正與傳遞之裝置及其方法，適用以一類比之校正訊號對遠端之一量測儀器進行校正。首先由校正裝置之一訊號產生單元產生校正訊號，並由一第一轉換單元轉換校正訊號，而產生一第一數位訊號，並提供至少一修正值，藉以供一回授控制單元修正該第一數位訊號，產生一第二數位訊號至一遠端，然後由一第二轉換單元轉換該遠端之該第二數位訊號為一模擬類比之模擬校正訊號，並由一第三轉換單元將該模擬類比之模擬校正訊號轉換成一第三數位訊號，而回授調整該第二數位訊號，直到該第三與第一數位訊號的差異小於一預設值，而使該模擬校正訊號逼近一穩定模擬類比校正訊號。同時，以一同訊號量測器分別量測該校正訊號、穩定模擬校正訊號，調整該等修

英文發明摘要 （發明之名稱：）

四、中文發明摘要 （發明之名稱：遠端校正與傳遞之裝置及其方法）

正值，然後重複上述步驟直到該量測差異小於另一預設值即完成遠端傳遞的建立。

英文發明摘要 （發明之名稱：）

發明說明

本發明關於一種遠端校正與傳遞之裝置及其方法；且本發明特別有關於一種儀器之遠端校正與傳遞裝置，應用該遠端校正與傳遞的方法，對一量測儀器進行校正。

量測儀器本身需要校正才能維持準確度。其校正工作的進行，一般係藉由專門的校正器提供精準的校正電性特徵，再以待校的儀器量測該校正電性特徵，而獲得該儀器的量測誤差值，以調整該儀器。例如校正電表時，常是利用校正器提供一既定電壓進行校正。一些校正器，例如Fluke 5700A的多功能校正器可以提供多種電性特徵，如電壓、電阻、電容等等。

對於需要儀器校正的單位，校正器的價格相當昂貴，因此常需要向擁有校正器的單位(例如國家級的研究機構)租用，將成批的量測儀器送到定點進行量測。儀器校正其間的人力、物力消耗頗大；再者，需考慮運輸途中有哪些因素，會對校正好的量測儀器產生影響。典型的儀器校正方式需要改進。

現今通訊系統發達，若能透過通訊系統進行儀器校正，將可改良上述典型儀器校正方法的缺點。

有鑑於此，本發明係提出如下：

發明概述

本發明之第一特徵為一種校正裝置，適用以在第一區以一校正訊號對第二區之一量測儀器進行校正，該校正裝

置包括：一訊號產生單元，產生該校正訊號；一第一轉換單元，依據第一範圍之參考訊號，轉換該校正訊號，產生對應之一第一數位訊號；一回授控制單元，依據至少一修正值修正該第一數位訊號，而產生一第二數位訊號；一第二轉換單元，依據第二範圍之參考訊號，轉換該第二數位訊號，產生對應之一模擬校正訊號；一第三轉換單元，依據第三範圍之參考訊號，轉換該模擬校正訊號，產生對應之第三數位訊號；其中，該回授控制單元更連續地調整該第二數位訊號，直使該第一與第三數位訊號之差異小於預設值，而使該模擬校正訊號成為逼近該校正訊號的一穩定模擬校正訊號，該穩定模擬校正訊號係適用以校正該量測儀器。

該訊號產生單元、第一轉換單元、以及該回授控制單元係設於該第一區，而該第二、第三轉換單元係設於該第二區。

該校正裝置更包括一通訊裝置，在該第一區與第二區間傳遞該等第一、第二、與第三數位訊號。該通訊裝置為一網際網路系統。

該修正值包括該第一、第二、第三範圍間的比例；或包括該第一、第二、第三參考訊號範圍間的相互偏差。

該回授控制單元係設置在一電腦。

本發明之第二特徵為一種傳遞裝置，用以由第一區傳遞一類比訊號至第二區，該傳遞裝置包括：一第一轉換單元，依據第一範圍之參考訊號轉換該類比訊號，產生對應

之一第一數位訊號；一回授控制單元，依據至少一修正值修正該第一數位訊號，而產生一第二數位訊號至該第二區；一第二轉換單元，依據第二範圍之參考訊號轉換該第二數位訊號，產生對應之一模擬類比訊號；一第三轉換單元，依據第三範圍之參考訊號轉換該模擬類比訊號，產生對應之第三數位訊號；其中，該回授控制單元更連續地調整該第二數位訊號，直使該第一、第三數位訊號之差異小於預設值，而使該模擬類比訊號成為逼近該類比訊號之一穩定模擬類比訊號。

其中，該第一轉換單元與該回授控制單元係設於該第一區，而該第二、第三轉換單元係設於該第二區。該傳遞裝置更包括一通訊裝置，在該第一、第二區之間傳遞該第一、第二、與第三數位訊號。該通訊裝置為一網際網路系統。

該修正值包括該第一、第二與第三範圍之間的範圍比例；或包括該第一、第二與第三範圍之間的相互偏移。

該回授控制單元係設置在一電腦。

本發明之第三特徵為一種建立遠端校正的方法，其中該遠端校正係以一校正訊號對遠端之一量測儀器進行校正，該方法步驟包括：轉換該校正訊號，而產生一第一數位訊號；提供至少一修正值，藉以修正該第一數位訊號，產生一第二數位訊號；傳遞該第二數位訊號至該遠端；轉換該遠端之該第二數位訊號為一模擬校正訊號；轉換該模擬校正訊號為一第三數位訊號；回授該第三數位訊號，藉

以調整該第二數位訊號，直使該第三與第一數位訊號的差異小於一預設值，而使該模擬校正訊號逼近一穩定模擬校正訊號，其中該穩定模擬校正訊號係用以校正該量測儀器；提供一訊號量測器，分別量測該校正訊號、以及該穩定模擬校正訊號，並依據該穩定模擬校正訊號與該校正訊號的量測差異調整該等修正值；以及重複上述步驟，直到該量測差異小於另一預設值。

本發明之第四特徵為一種建立遠端校正的方法，其中該遠端校正係以一校正訊號對遠端之一量測儀器進行校正，該方法步驟包括：將該校正訊號以一數位轉換過程傳遞至該遠端，並經由類比轉換變回一模擬校正訊號；回授該模擬校正訊號而調整該數位轉換過程，直到該模擬校正訊號成為逼近該校正訊號之一穩定模擬校正訊號，其中該穩定模擬校正訊號係用以校正該量測儀器。

本發明之第五特徵為一種建立遠端傳遞的方法，其中該遠端傳遞係用以傳遞一類比訊號至遠端，該方法步驟包括：轉換該類比訊號，而產生一第一數位訊號；提供至少一修正值，藉以修正該第一數位訊號，產生一第二數位訊號；傳遞該第二數位訊號至該遠端；轉換該遠端之該第二數位訊號為一模擬類比訊號；轉換該模擬類比訊號為一第三數位訊號；回授該第三數位訊號，藉以調整該第二數位訊號，直使該第三與第一數位訊號的差異小於一預設值，而使該模擬類比訊號逼近一穩定模擬類比訊號；提供一訊號量測器，分別量測該類比訊號、以及該穩定模擬類比訊

號，並依據該穩定模擬類比訊號與該類比訊號的量測差異調整該等修正值；以及重複上述步驟，直到該量測差異小於另一預設值。

本發明之第六特徵為一種建立遠端傳遞的方法，其中該遠端傳遞係用以傳遞一類比訊號至遠端，該方法步驟包括：將該類比訊號以一數位轉換過程傳遞至該遠端，並經由類比轉換變回一模擬類比訊號；回授該模擬類比訊號而調整該數位轉換過程，直到該模擬類比訊號成為逼近該類比訊號之一穩定模擬類比訊號。

本發明之第七特徵為一種校正如申請專利範圍第1項所述之校正裝置的方法，其步驟包括：提供一訊號量測器，分別量測該校正訊號、以及該穩定模擬校正訊號，並依據該穩定模擬校正訊號與該校正訊號的量測差異調整該等修正值；以及重複上述步驟，直到該量測差異小於一預設值。

本發明之第八特徵為一種校正如申請專利範圍第8項所述之傳遞裝置的方法，其步驟包括：提供一訊號量測器，分別量測該類比訊號、以及該穩定模擬類比訊號，並依據該穩定模擬類比訊號與該類比訊號的量測差異調整該等修正值；以及重複上述步驟，直到該量測差異小於一預設值。

圖示之簡單說明：

為讓本發明之上述目的、特徵及優點能更明顯易懂，

下文特舉一較佳實施例，並配合所附圖式，作詳細說明如下：

第1圖係顯示本發明實施例之傳遞裝置的架構圖。

第2圖係顯示本發明實施例之校正裝置的架構圖。

第3圖係圖示本發明之建立遠端傳遞的方法。

第4圖係顯示詳細的本發明之建立遠端傳遞的方法。

第5圖係顯示本發明之傳遞裝置的校正方法。

符號說明

100~傳遞裝置；	200~校正裝置；
10~第一轉換單元；	20~回授控制單元；
30~第二轉換單元；	40~第三轉換單元；
50~通訊裝置；	60~校正器；
70~量測儀器；	AS~類比訊號；
CS~校正訊號；	DS1~第一數位訊號；
DS2~第二數位訊號；	DS3~第三數位訊號；
CE~修正值；	SAS~模擬類比訊號；
SCS~模擬校正訊號；	SSAS~穩定模擬類比訊號；
SSCS~穩定模擬校正訊號。	

實施例之詳細說明：

如第1圖所示，為本發明之傳遞裝置100的架構圖。

在前面提到的校正器中，為保持所提供的校正電壓的準確性，輸出端的連接線的長度一般必須低於一公尺。本

發明係提出一傳遞裝置100，用以遠距傳遞一類比訊號AS而使該訊號的失真度小於既定值。藉由這種傳遞裝置100，便可用以精確地傳遞該校正器的輸出校正電壓到待測儀器的一端，進行一「遠端校正」。該傳遞裝置100包括一第一轉換單元10、一回授控制單元20、一第二轉換單元30、以及一第三轉換單元40。

第一轉換單元10以及回授控制單元20是位於提供校正電壓的第一區。電子裝置進行類比與數位間的轉換(A/D、D/A Convert)時，係依據外部提供參考訊號(通常是固定的參考電壓)決定其輸出。第一轉換單元10是依據第一範圍之參考訊號轉換該類比訊號AS，產生對應之一第一數位訊號DS1。回授控制單元20是依據至少一修正值CE修正該第一數位訊號DS1，而產生一第二數位訊號DS2至第二區。第一區與第二區間可以具有一相當長的距離，例如由美國到日本；然而也可以只是分別在同一棟建築物內的不同房間。

第二、第三轉換單元30、40位於第二區。第二轉換單元30是依據第二範圍之參考訊號轉換該第二數位訊號DS2，產生對應之一模擬類比訊號SAS；而該第三轉換單元40則依據第三範圍之參考訊號轉換該模擬類比訊號SAS，產生對應之第三數位訊號DS3。第三數位訊號DS3係用來作為回授訊號，傳回該回授控制單元20。

以下說明回授控制單元20所依據的修正值CE。設定修正值CE是為了抵銷上述第一、第二、第三範圍之參考訊號

(電壓)之間的誤差。理想上，以相同的之參考訊號(電壓)進行類比與數位轉換就不必考慮上述誤差問題；但實際上，第二區的電壓源與第一區的參考電壓是不相同的。例如，將兩方各自測得的是5V的兩組電壓拿來做比較，第二區的5V可能恰是第一區的5.001V。因此，在第一區輸出數位轉換後的類比訊號AS(亦即第一數位訊號DS1)時，要經過上述的修正值調整後才能抵銷兩端之不同條件造成的差異。該修正值最好包括該第一、第二與第三範圍的範圍比例，以抵銷轉換過程中造成的訊號增大或縮小；以及包括該第一、第二與第三範圍之間零電位的實際差異，以修正轉換過程中造成的訊號偏移。

此外，為克服其他因素(如溫度、濕度、震動、等等)所產生的誤差，該回授控制單元20連續地回授該第三數位訊號DS3，並調整該第二數位訊號DS2，直使該第一、第三數位訊號DS1、DS3之差異小於預設值，而使該模擬類比訊號SAS成為逼近該類比訊號之一穩定模擬類比訊號SSAS。

另外有一通訊裝置50，用以在該第一區與第二區之間傳遞該第一、第二、與第三數位訊號。該通訊裝置50最好是現有的網際網路系統，或區域網路也可以。此外，該回授控制單元最好係設置在一電腦，亦即使軟體形式存在。

由於遠端精確的傳輸只能靠數位訊號，但數位訊號只能表示一地的主觀電壓值，並不能真實表現該地與另一地間相對電壓值，第一區無法透過遠距通訊(包括電話詢問)獲得上述第一、第二、第三範圍的相對於第一區的值。因

此，本發明在或的上述修正值CE的部分，必須靠人工，以相同的一訊號量測器對兩端的輸入、輸出訊號(亦即該類比訊號AS與該模擬類比訊號SAS)分別進行多組測量，以估算所需的上述修正值CE。經由調整後的修正值CE，便可用以在日後專門用來對該第二區傳遞該類比訊號AS(前提是該第一區、第二區的各單元裝置不變)。

如第2圖所示，提供校正服務時，係以一訊號產生單元，亦即一校正器60所提供的校正訊號CS(通常為校正電壓)，作為上述類比訊號AS傳送至待測的第二區。此時便產生本發明所提出的校正裝置200，其產生的穩定模擬類比訊號SSAS在此校正裝置200中稱為穩定模擬校正訊號SSCS，提供一量測儀器70校正之用，此外其他單元不變，在此不再贅述。

需要校正服務的客戶有許多時，則事先派人至各客戶端檢測，對於每一為客戶端建立一組特定的修正值，以供日後進行校正服務。當然，為維護精確性，定期地檢查、再修正各修正值是必須的。

上述本發明的裝置係根據本發明所提出的方法而產生。以下說明本發明所提出之建立遠端傳遞的方法。請參考第3圖的方塊圖。如前面所述的，該遠端傳遞係用以傳遞一類比訊號AS至遠端，該方法步驟包括：(S1)將該類比訊號AS以一數位轉換過程傳遞至該遠端，並經由類比轉換變回一模擬類比訊號SAS；以及(S2)回授該模擬類比訊號SAS而調整該數位轉換過程，直到該模擬類比訊號SAS成為

逼近該類比訊號之一穩定模擬類比訊號SSAS。

第4圖更詳細地說明本發明之建立遠端傳遞的方法，其中包括步驟：(S1)轉換該類比訊號AS，而產生一第一數位訊號DS1；(S2)提供至少一修正值CE，藉以修正該第一數位訊號DS1，產生一第二數位訊號DS2；(S3)傳遞該第二數位訊號DS2至該遠端；(S4)轉換該遠端之該第二數位訊號DS2為一模擬類比訊號SAS；(S5)轉換該模擬類比訊號SAS為一第三數位訊號DS3；(S6)回授該第三數位訊號DS3，藉以調整該第二數位訊號DS2，直使該第三與第一數位訊號DS3、DS1的差異小於一預設值，而使該模擬類比訊號SAS逼近一穩定模擬類比訊號SSAS；(S7)提供一訊號量測器，分別量測該類比訊號AS、以及該穩定模擬類比訊號SSAS，並依據該穩定模擬類比訊號SSAS與該類比訊號AS的量測差異調整該等修正值；以及(S8)重複上述步驟，直到該量測差異小於另一預設值。

此外，本發明提出應用上述遠端傳遞之方法的遠端校正方法。其中，係以上述的校正訊號CS作為上述類比訊號AS；而上述穩定模擬類比訊號SSAS係用來提供遠端一待測之量測儀器校正電壓。該遠端校正方法其他部分與該遠端傳遞方法相同，在此不再贅述。

再者，本發明所在前面提出，該傳遞裝置100的修正值的調整，係來自本發明所提出的校正方法，用以校正該傳遞裝置100。其中包括第5圖所示的步驟：(S1)提供一訊號量測器，分別量測該類比訊號AS、以及該穩定模擬類比

訊號SSAS，並依據該穩定模擬類比訊號SSAS與該類比訊號AS的量測差異調整該等修正值；以及(S2)重複上述步驟，直到該量測差異小於一預設值。

利用該傳遞裝置100的校正裝置200也可利用上述方法校正，其中，係以該校正訊號CS作為該類比訊號AS；並以該穩定模擬校正訊號SSCS作為穩定模擬類比訊號SSAS。其餘部分方法相同而不佳贅述。

透過本發明的裝置與方法，進行遠端量測，待測端只要預先建立修正值的資料，便可透過通訊系統，例如網際網路進行校正，而不必每次校正都搬運量測儀器。如此可有效節省人力、物力、時間等諸多成本。本發明對於頻繁需要校正量測儀器的單位尤其重要。

雖然本發明已以具體之實施例說明如上，然其並非用以限定本發明，任何熟習此項技藝者，在不脫離本發明之精神和範圍內，當可作更動與潤飾。因此，本發明之保護範圍當視後附之申請專利範圍所界定者為準。

六、申請專利範圍

1. 一種校正裝置，適用以在第一區以一校正訊號對第二區之一量測儀器進行校正，該校正裝置包括：

一訊號產生單元，產生該校正訊號；

一第一轉換單元，依據第一範圍之參考訊號，轉換該校正訊號，產生對應之一第一數位訊號；

一回授控制單元，依據至少一修正值修正該第一數位訊號，而產生一第二數位訊號；

一第二轉換單元，依據第二範圍之參考訊號，轉換該第二數位訊號，產生對應之一模擬校正訊號；

一第三轉換單元，依據第三範圍之參考訊號，轉換該模擬校正訊號，產生對應之第三數位訊號；以及

其中，該回授控制單元更連續地調整該第二數位訊號，直使該第一與第三數位訊號之差異小於預設值，而使該模擬校正訊號成為逼近該校正訊號的一穩定模擬校正訊號，該穩定模擬校正訊號係適用以校正該量測儀器。

2. 如申請專利範圍第1項所述的校正裝置，其中該訊號產生單元、第一轉換單元、以及該回授控制單元係設於該第一區，而該第二、第三轉換單元係設於該第二區。

3. 如申請專利範圍第2項所述的校正裝置，其中更包括一通訊裝置，在該第一區與第二區間傳遞該等第一、第二、與第三數位訊號。

4. 如申請專利範圍第3項所述的校正裝置，其中該通訊裝置為一網際網路系統。

5. 如申請專利範圍第1項所述的校正裝置，其中該修

六、申請專利範圍

括一通訊裝置，在該第一、第二區之間傳遞該第一、第二、與第三數位訊號。

11. 如申請專利範圍第10項所述的傳遞裝置，其中該通訊裝置為一網際網路系統。

12. 如申請專利範圍第8項所述的傳遞裝置，其中該修正值包括該第一、第二與第三範圍之間的範圍比例。

13. 如申請專利範圍第8項所述的傳遞裝置，其中該修正值包括該第一、第二與第三範圍之間的相互偏移。

14. 如申請專利範圍第8項所述的傳遞裝置，其中該回授控制單元係設置在一電腦。

15. 一種建立遠端校正的方法，其中該遠端校正係以一校正訊號對遠端之一量測儀器進行校正，該方法步驟包括：

轉換該校正訊號，而產生一第一數位訊號；

提供至少一修正值，藉以修正該第一數位訊號，產生一第二數位訊號；

傳遞該第二數位訊號至該遠端；

轉換該遠端之該第二數位訊號為一模擬校正訊號；

轉換該模擬校正訊號為一第三數位訊號；

回授該第三數位訊號，藉以調整該第二數位訊號，直使該第三與第一數位訊號的差異小於一預設值，而使該模擬校正訊號逼近一穩定模擬校正訊號，其中該穩定模擬校正訊號係用以校正該量測儀器；

提供一訊號量測器，分別量測該校正訊號、以及該穩

定模擬校正訊號，並依據該穩定模擬校正訊號與該校正訊號的量測差異調整該等修正值；以及

重複上述步驟，直到該量測差異小於另一預設值。

16. 一種建立遠端校正的方法，其中該遠端校正係以一校正訊號對遠端之一量測儀器進行校正，該方法步驟包括：

將該校正訊號以一數位轉換過程傳遞至該遠端，並經由類比轉換變回一模擬校正訊號；以及

回授該模擬校正訊號而調整該數位轉換過程，直到該模擬校正訊號成為逼近該校正訊號之一穩定模擬校正訊號，其中該穩定模擬校正訊號係用以校正該量測儀器。

17. 一種建立遠端傳遞的方法，其中該遠端傳遞係用以傳遞一類比訊號至遠端，該方法步驟包括：

轉換該類比訊號，而產生一第一數位訊號；

提供至少一修正值，藉以修正該第一數位訊號，產生一第二數位訊號；

傳遞該第二數位訊號至該遠端；

轉換該遠端之該第二數位訊號為一模擬類比訊號；

轉換該模擬類比訊號為一第三數位訊號；

回授該第三數位訊號，藉以調整該第二數位訊號，直使該第三與第一數位訊號的差異小於一預設值，而使該模擬類比訊號逼近一穩定模擬類比訊號；

提供一訊號量測器，分別量測該類比訊號、以及該穩定模擬類比訊號，並依據該穩定模擬類比訊號與該類比訊

六、申請專利範圍

號的量測差異調整該等修正值；以及

重複上述步驟，直到該量測差異小於另一預設值。

18. 一種建立遠端傳遞的方法，其中該遠端傳遞係用以傳遞一類比訊號至遠端，該方法步驟包括：

將該類比訊號以一數位轉換過程傳遞至該遠端，並經由類比轉換變回一模擬類比訊號；以及

回授該模擬類比訊號而調整該數位轉換過程，直到該模擬類比訊號成為逼近該類比訊號之一穩定模擬類比訊號。

19. 一種校正如申請專利範圍第1項所述之校正裝置的方法，其步驟包括：

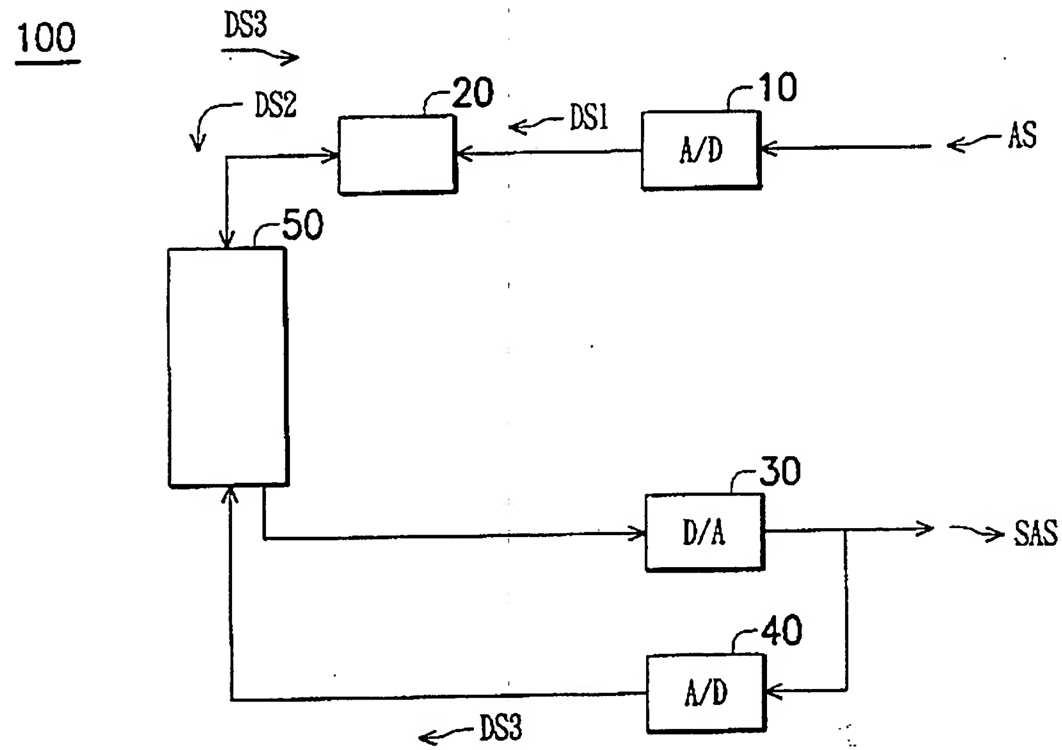
提供一訊號量測器，分別量測該校正訊號、以及該穩定模擬校正訊號，並依據該穩定模擬校正訊號與該校正訊號的量測差異調整該等修正值；以及

重複上述步驟，直到該量測差異小於一預設值。

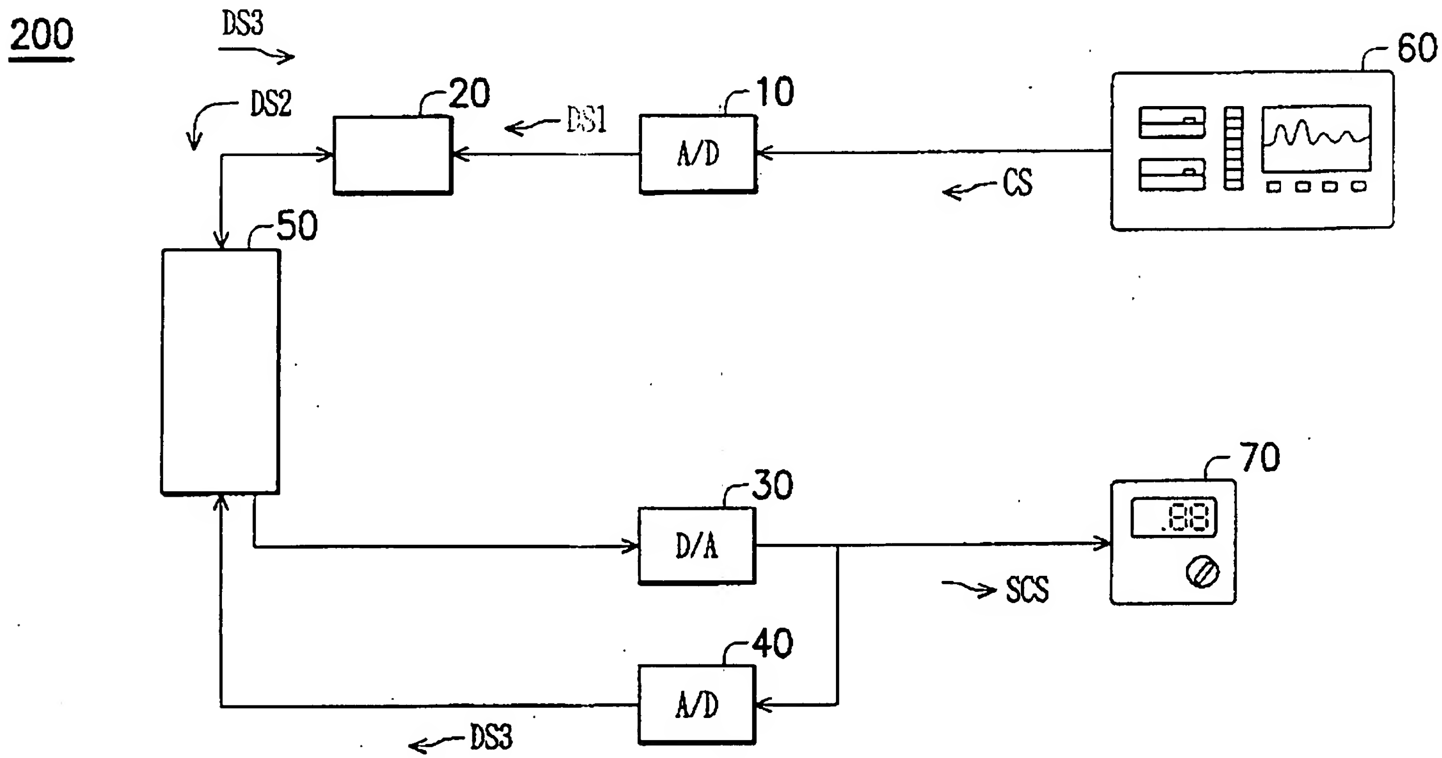
20. 一種校正如申請專利範圍第8項所述之傳遞裝置的方法，其步驟包括：

提供一訊號量測器，分別量測該類比訊號、以及該穩定模擬類比訊號，並依據該穩定模擬類比訊號與該類比訊號的量測差異調整該等修正值；以及

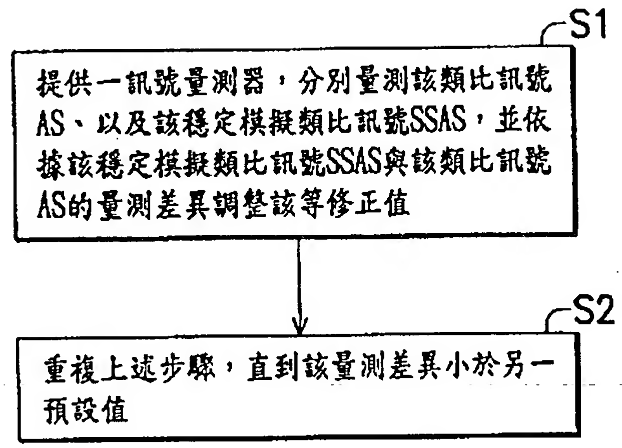
重複上述步驟，直到該量測差異小於一預設值。



第 1 圖



第 2 圖


S1
提供一訊號量測器，分別量測該類比訊號AS、以及該穩定模擬類比訊號SSAS，並依據該穩定模擬類比訊號SSAS與該類比訊號AS的量測差異調整該等修正值
S2
重複上述步驟，直到該量測差異小於另一預設值

第 5 圖